REMARKS

Claims 1, 2, 6 to 10, and 12 to 16, as amended, and new claims 17 to 24 appear in this application for the Examiner's review and consideration. Claims 13 to 16 have been withdrawn, as being directed to a non-elected invention. Claim 4 is canceled without prejudice by this Amendment. Claims 3, 5, and 11 were canceled by a prior Amendment. The new claim and the amendments are fully supported by the specification and claims as originally filed. Therefore, there is no issue of new matter.

Claims 1, 2, 4, 6 to 9, 11, and 12 stand rejected under 35 U.S.C. § 103(a), as being unpatentable over U.S. Patent No. 3,164,487 to Carley-Macauly et al. (Carley-Macauly) in view of U.S. Patent No. 3,305,325 to Nicholson et al. (Nicholson) and U.S. Patent No. 4,073,834 to Mysels, and further in view of U.S. Patent No. 3,129,141 to Burnham et al. (Burnham) and U.S. Patent No. 6,190,162 to Smith et al. (Smith) for the reasons set forth on pages 3 to 6 of the Final Office Action.

In response, Applicants submit that the presently claimed invention is directed to a method to produce uranium dioxide fuel in pellet shape for use in a light water reactor. The presently claimed method comprises providing an arrangement, comprising porous uranium dioxide, infiltrating the arrangement with a precursor liquid, and thermally treating the infiltrated arrangement, such that the precursor liquid is converted to a second phase. The step of thermally treating the arrangement comprises curing the infiltrated arrangement, converting the precursor liquid into a solid polymer, and thermally firing the cured infiltrated arrangement.

In contrast to the presently claimed method, Carley-Macauly discloses a method for producing carbon-impregnated artifacts. The disclosed carbon-impregnated artifacts have a low permeability to gases, and may contain fissile material, such as that used as fuel in a nuclear reactor. The carbon-impregnated artifacts are produced by placing an artifact, having high open porosity and low thermal conductivity, in an atmosphere of hydrocarbon gas. While the artifact is in the atmosphere of hydrocarbon gas, an initial zone of the artifact is heated to a temperature at which carbon is deposited from the gas permeating the artifact by pyrolysis of the gas to impregnate fully the initial zone. The temperature of the impregnated zone is then raised progressively to maintain the temperature within an advancing impregnated/non-impregnated boundary zone, and the rate of the rise in temperature in the initial zone is limited, so that the advancing boundary zone is fully impregnated.

The clear teaching of Carley-Macauly is that hydrocarbon gases that polymerize should be avoided, as polymerization results in deposition in "unwanted places." *See* Carley-Macauly, column 4, lines 35 to 38. Therefore, Carley-Macauly does not disclose or suggest a method that requires polymerization, provides no reason for one of ordinary skill in the art to obtain such a method, and, thus, fails to provide any reason for one of ordinary skill in the art to use a process that results in the formation of a solid polymer, as presently claimed. Carley-Macauly also fails to provide any reason for one of ordinary skill in the art to modify the teachings of that reference in a manner that requires polymerization to deposit the carbon.

Nicholson does nothing to overcome the deficiencies of Carley-Macauly. As cited in the Office Action, at column 5, lines 63 to 70, and column 6, lines 10 to 16 and 20 to 22, Nicholson discloses depositing carbon in the pores of a refractory body, and converting the carbon to silicon carbide by releasing free silicon to react with the carbon. Nicholson does not disclose or suggest, and provides no reason for one of ordinary skill in the art to thermally treat an arrangement, comprising porous uranium dioxide, that is infiltrated with a precursor liquid, such that the precursor liquid is converted to a second phase, where the step of thermally treating the infiltrated arrangement comprises curing the arrangement, converting the precursor liquid into a solid polymer, and thermally firing the cured porous uranium dioxide arrangement, as presently claimed. Even if one of ordinary skill in the art combined the disclosure of Nicholson with that of Carley-Macauly, the resulting combination would not provide the presently claimed method.

Mysels does nothing to overcome the deficiencies of Carley-Macauly and Nicholson. Mysels carbon can be deposited in the pores of a fuel element by placing a phenol-formaldehyde prepolymer or furfuryl alcohol monomer/prepolymer into the pores of the fuel element, curing the prepolymer, and then decomposing the cured polymer. However, as discussed above, the clear teaching of Carley-Macauly is that materials that polymerize on heating should not be used in the disclosed method, as polymerization results in deposition in "unwanted places." Therefore, the combination of the disclosure of Mysels with that of Carley-Macauly is not proper. One of ordinary skill in the art following the teaching of Carley-Macauly would not deposit carbon with a material that polymerizes during deposition.

Burnham does nothing to overcome the deficiencies of Carley-Macauly and the other cited references. Burnham discloses a fuel element, a fuel element material for

nuclear reactors, and a process for making such fuel elements. Burnham, column 1, lines 11 to 13. The fuel element disclosed by Burnham contains silicon bonded silicon carbide as a base material into which a desired amount of fissionable material is incorporated. Column 1, lines 25 to 29. The disclosed fuel element "comprises a dense body consisting essentially of uranium carbide, graphite, silicon carbide and silicon." Column 1, lines 33 to 35. The uranium carbide is supported by a matrix of silicon bonded silicon carbide, where the uranium carbide is dispersed substantially uniformly throughout the silicon bonded silicon carbide matrix. Column 1, lines 38 to 47. Thus, Burnham discloses nuclear fuel material interspersed into a silicon/silicon carbide matrix. That is not the product of the presently claimed method, which, in one embodiment, comprises silicon carbide interspersed in the pores of an arrangement comprising porous uranium dioxide.

Burnham, whether taken alone or in combination with the other cited references, does not disclose or suggest the presently claimed method, and provides no reason for one of ordinary skill in the art to obtain the presently claimed method. One of ordinary skill in the art combining the disclosure of Burnham with that of Carley-Macauly and the other cited references would not obtain the presently claimed method. One of ordinary skill in the art following the disclosure of Burnham and the other cited references would obtain a process for preparing a silicon/silicon carbide artifact. That is not the presently claimed method.

Smith does nothing to overcome the deficiencies of Carley-Macauly and the other cited references. Smith discloses an infrared heater, and methods of making the heater. The heater contains a gas fired burner, having a metallic burner body with a combustion plenum chamber, a matrix which covers the combustion mixture plenum, and a screen made of fibers treated with a silicon carbide forming mixture. The matrix is made from ceramic or metallic fibers treated with a pre-ceramic polymer containing silicon and carbon. As stated in the Office Action, the pre-ceramic polymer may be AHPCS (allylhydridopolycarbosilane).

Smith discloses that AHPCS is a liquid base pre-ceramic polymer. Column 3, lines 30 and 31. Smith further discloses that the properties of AHPCS include a viscosity in the range of about 250 to about 8,000 millipoise, a specific gravity of about 0.95, and a cure temperature of about 250° to about 400°C. Column 3, lines 35 to 38. However, Smith does not disclose or suggest that the AHPCS is cured prior to pyrolysis during the manufacture of the heater, and provides no reason for one of ordinary skill in the art to do so.

Instead, Smith discloses that a screen is treated with a silicon carbide forming mixture, such as the liquid base pre-ceramic polymer AHPCS, which is then pyrolyzed at a temperature of up to about 1,000°C. Smith does not disclose or suggest that the AHPCS is first cured to form a solid polymer, and then thermally fired, as presently claimed. Even if one of ordinary skill in the art combined the disclosure of Smith with that of Carley-Macauly and the other cited references, the resulting combination would not provide the presently claimed method. Instead, one of ordinary skill in the art, following the disclosure of Smith the other references would pyrolyze the AHPCS without first curing the liquid base pre-ceramic polymer.

Therefore, as the combination of the disclosure of Carley-Macauly and Mysels is improper, and the combination of Carley-Macauly and the other cited references does not provide the presently claimed method, the present claims are not obvious over Carley-Macauly, Nicholson, Mysels, Burnham, and Smith, whether taken alone or in combination. Accordingly, it is respectfully requested that the Examiner withdraw the rejection of claims 1, 2, 4, 6 to 9, 11, and 12 under 35 U.S.C. § 103(a) over those references.

Applicants thus submit that the entire application is now in condition for allowance, an early notice of which would be appreciated. Should the Examiner not agree with Applicants' position, a personal or telephonic interview is respectfully requested to discuss any remaining issues prior to the issuance of a further Office Action, and to expedite the allowance of the application.

A separate Petition for Extension of Time is submitted herewith. Should any other fees be due, however, please charge such fees to Deposit Account No. 11-0600.

Respectfully submitted,

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